

FCC Part 22/24 Compliance Test Report

Test Report no.:	Tre_FCC_0534_03.doc	Date of Report:	7.9.2005
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FCC listing no.:	94436		
IC recognition no.:	3608		
Tested devices/ accessories:	GSM phone RM-56 / Battery BL-5C, AC-charger AC-4, Headset HS-23, Memory card MU-17, Dummy battery SD-4 v.1161		
FCC ID:	LJPRM-56	IC:	661E-RM56
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 22 and 24, TIA-603-B-2002 and IC standards RSS-132 and RSS-133. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test Results:	The EUT complies with the requirements in respect of all parameters subject to the test. The test results relate only to devices specified in this document.		
Date and signature for the contents:			

Jan-Erik Lilja, System Manager

1. Summary for FCC Part 22/24 Compliance Test Report

Date of receipt	24.8.2005
Testing completed	5.9.2005
The customer's contact person	Jorma Hanni
Test Plan referred to	\\EMC\\TESTPLAN\\
Notes	-
Document name	T:\\Projects\\RM-56\\results\\emc\\FCC\\Tre_FCC_0534_03.doc

1.1. EUT and Accessory Information

The EUT is a dual band (GSM850/1900) mobile phone with GPRS and EGPRS. The EUT is tested with maximum rated TX power, modulated with pseudo random bit sequence (PRBS9).

Product	Type	SN	HW	MV	SW	DUT
GSM phone	RM-56	004400/58/164239/2	1101	-	03.07	40319
GSM phone	RM-56	004400/58/164222/8	1101	-	03.07	40320
AC-Charger	AC-4	-	1.0	3.0	-	40321
Memory Card	MU-17	-	-	-	-	40322
Battery	BL-5C	-	-	-	-	40323
Headset	HS-23	-	-	-	-	40324
Dummy battery	SD-4 v.1161	-	-	-	-	40241

1.2. Summary of Test Results

GSM 850:

Section in CFR 47	Section in RSS-132	Name of the test	Result
§2.1046(a), 22.913(a)	4.4	Conducted RF output power	NP
§22.913(a)	4.4, 6.4	Radiated RF output power	PASSED
§2.1049(h)	4.2	99 % occupied bandwidth	PASSED
§22.917(a)	4.5	Band edge compliance	PASSED
§22.917(a), §2.1051	4.5	Spurious emissions at antenna terminals	NP
§22.917(a), §2.1053	4.5	Spurious radiated emissions	PASSED
§2.1055(a)	4.3, 6.3	Frequency stability, temperature variation	PASSED
§2.1055(d)	4.3, 6.3	Frequency stability, voltage variation	PASSED

GSM 1900:

Section in CFR 47	Section in RSS-133	Name of the test	Result
§2.1046(a)	6.2	Conducted RF output power	NP
§24.232(b)	6.2	Radiated RF output power	PASSED
§2.1049(h)	5.6	99 % occupied bandwidth	PASSED
§24.238(a)	6.3	Band edge compliance	PASSED
§24.238(a), §2.1051	6.3	Spurious emissions at antenna terminals	NP
§24.238(a), §2.1053	6.3	Spurious radiated emissions	PASSED
§2.1055(a)	7	Frequency stability, temperature variation	PASSED
§2.1055(d)	7	Frequency stability, voltage variation	PASSED

PASSED The EUT complies with the essential requirements in the standard.

FAILED The EUT does not comply with the essential requirements in the standard.

NP The test was not performed by the TCC Nokia Tampere Laboratory.

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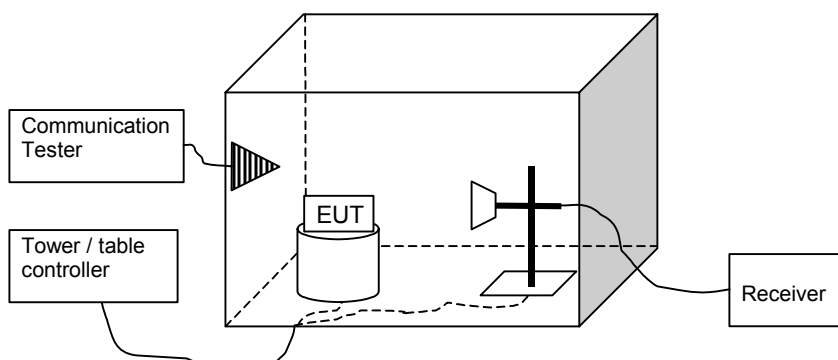
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2. Radiated RF output power (FCC §22.913(a), §24.232(b), RSS-132 6.4, RSS-133 6.2)

EUT with DUT number	RM-56: EUT 40319
Accessories with DUT numbers	AC-4: EUT 40321, MU-17: EUT 40322, BL-5C: EUT 40323, HS-23:EUT 40324
Operation Voltage [V] / [Hz]	115/60
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/44/100.2
Date of measurements	26.8.2005

2.1. Test setup



2.2. Test method and limit

The measurement is made according to TIA-603-B-2002 as follows:

The measurement is performed in the Anechoic Chamber with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system. The turntable is rotated 360 degrees and this is repeated for both horizontal and vertical receive antenna polarizations.

The EUT is placed on a nonconductive plate at 170 cm height.

The substitution method is used. Substitution values at each frequencies are measured beforehand and saved to the test software.

The substitution corrections are obtained as described below:

$$A_{SUBST} = P_{SUBST_TX} - P_{SUBST_RX} - L_{SUBST_CABLES} + G_{SUBST_TX_ANT}$$

Where A_{SUBST} is the final substitution correction including receive antenna gain. P_{SUBST_TX} is signal generator level, P_{SUBST_RX} is receiver level, L_{SUBST_CABLES} is cable losses including both TX and RX cables and $G_{SUBST_TX_ANT}$ is substitution antenna gain.

The measurement results are obtained as described below:

$$P [dBm] = P_{MEAS} + A_{TOT}$$

Where P_{MEAS} is receiver reading in dBm and A_{TOT} is total correction factor including cable loss and substitution correction ($A_{TOT} = L_{CABLES} + A_{SUBST}$).

Limits for radiated RF output power measurements

Frequency range [MHz]	Limit [W]	Limit [dBm]
824 - 849	7	38.5
1850 - 1910	2	33

2.3. GSM 850 Test results

GSM mode

Channel	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
128	27.90	0.617	- 3.70	31.60	VERTICAL	Passed
190	28.10	0.646	- 3.00	31.10	VERTICAL	Passed
251	29.10	0.813	- 2.20	31.30	VERTICAL	Passed

GPRS mode, 1 TX Slot

Channel	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
128	27.60	0.575	- 4.00	31.60	VERTICAL	Passed
190	28.10	0.646	- 3.00	31.10	VERTICAL	Passed
251	28.80	0.759	- 2.50	31.30	VERTICAL	Passed

GPRS mode, 2 TX Slots

Channel	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
128	27.90	0.617	- 3.70	31.60	VERTICAL	Passed
190	28.10	0.646	- 3.00	31.10	VERTICAL	Passed
251	28.80	0.759	- 2.50	31.30	VERTICAL	Passed

EGPRS mode, 1 TX Slot

Channel	ERP [dBm]	ERP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
128	23.00	0.200	- 8.60	31.60	VERTICAL	Passed
190	23.30	0.214	- 7.80	31.10	VERTICAL	Passed
251	24.10	0.257	- 7.20	31.30	VERTICAL	Passed

2.4. GSM 1900 Test results

GSM mode

Channel	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
512	31.00	1.259	- 11.10	42.10	HORIZONTAL	Passed

661	31.50	1.413	- 11.10	42.60	HORIZONTAL	Passed
810	29.20	0.832	- 12.00	41.20	HORIZONTAL	Passed

GPRS mode, 1 TX Slot

Channel	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
512	27.20	0.525	- 14.90	42.10	HORIZONTAL	Passed
661	30.00	1.000	- 10.60	40.60	VERTICAL	Passed
810	29.20	0.832	- 12.00	41.20	HORIZONTAL	Passed

GPRS mode, 2 TX Slots

Channel	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
512	30.70	1.175	- 11.40	42.10	HORIZONTAL	Passed
661	31.30	1.349	- 11.30	42.60	HORIZONTAL	Passed
810	29.40	0.871	- 11.80	41.20	HORIZONTAL	Passed

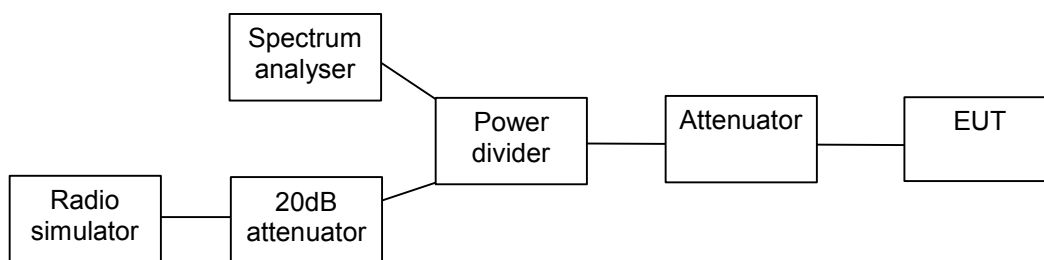
EGPRS mode, 1 TX Slot

Channel	EIRP [dBm]	EIRP [W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
512	29.10	0.813	- 13.00	42.10	HORIZONTAL	Passed
661	29.10	0.813	- 13.50	42.60	HORIZONTAL	Passed
810	30.40	1.096	- 11.70	42.10	HORIZONTAL	Passed

3. 99 % occupied bandwidth (FCC §2.1049(h), RSS-132 4.2, RSS-133 5.6)

EUT with DUT number	RM-56: EUT 40320
Accessories with DUT numbers	BL-5C: EUT 40323
Operation Voltage [V] / [Hz]	-
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.2
Date of measurements	29.8.2005
Measured by	Jari Jantunen

3.1. Test setup



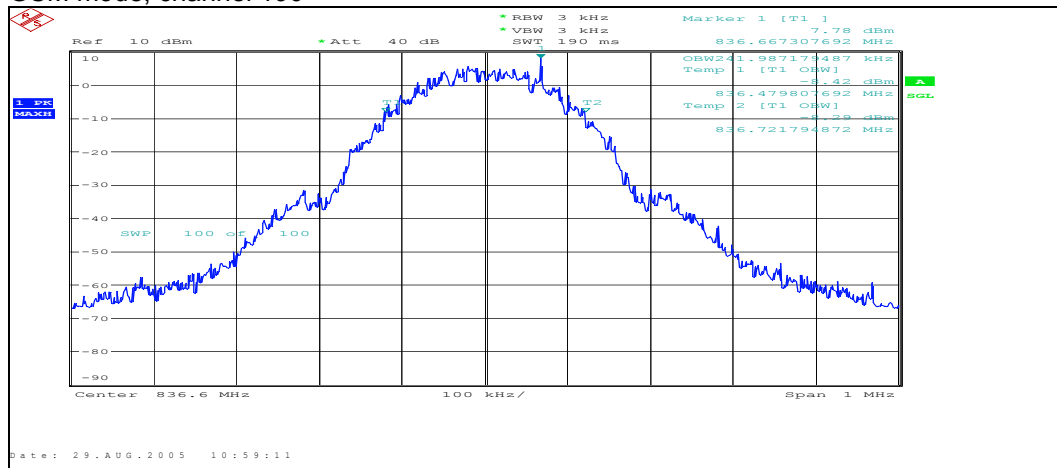
3.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-132 and RSS-133.

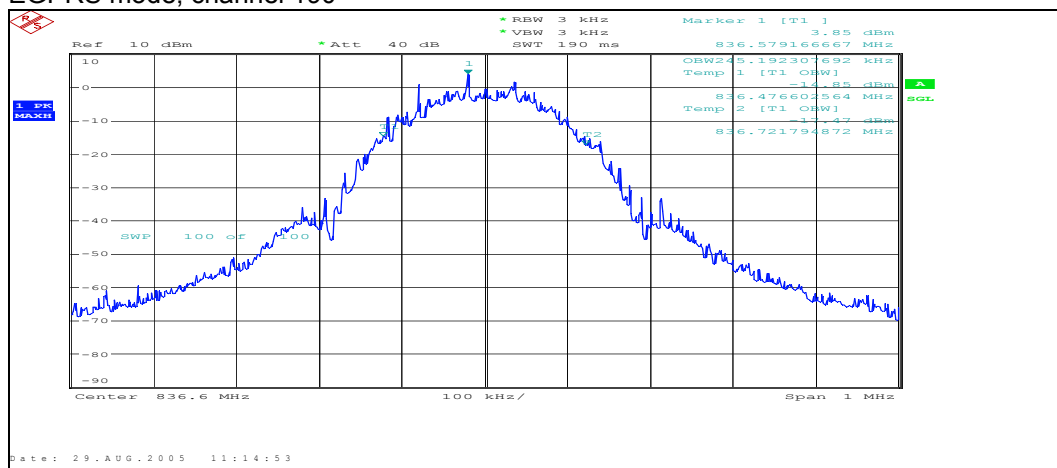
3.3. GSM 850 Test results

Operation mode (TX on)	99% occupied bandwidth [kHz]
GSM	241.987
EGPRS	245.192

GSM mode, channel 190



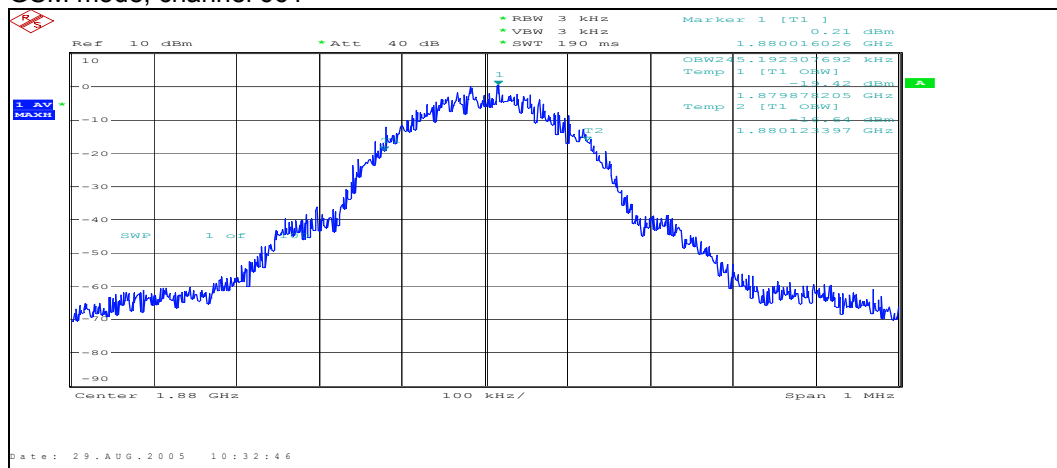
EGPRS mode, channel 190



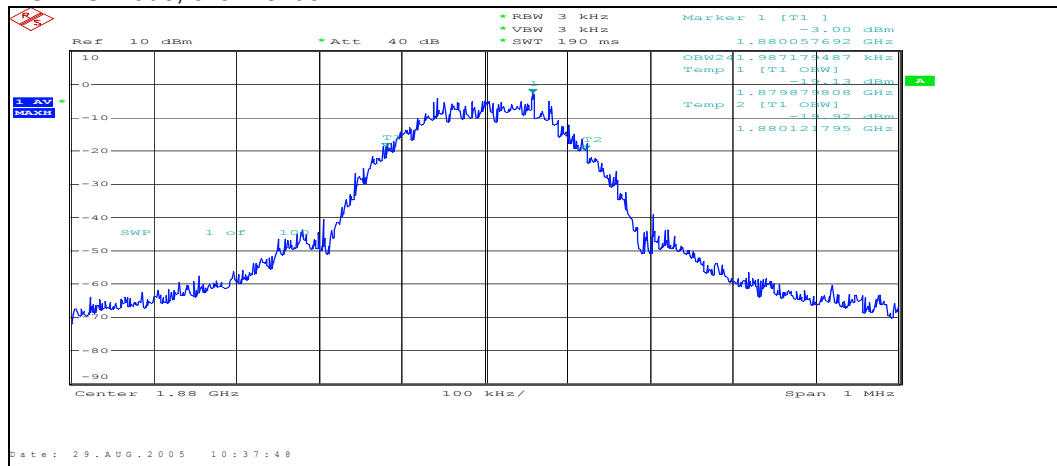
3.4. GSM 1900 Test results

Operation mode (TX on)	99% occupied bandwidth [kHz]
GSM	245.192
EGPRS	241.987

GSM mode, channel 661



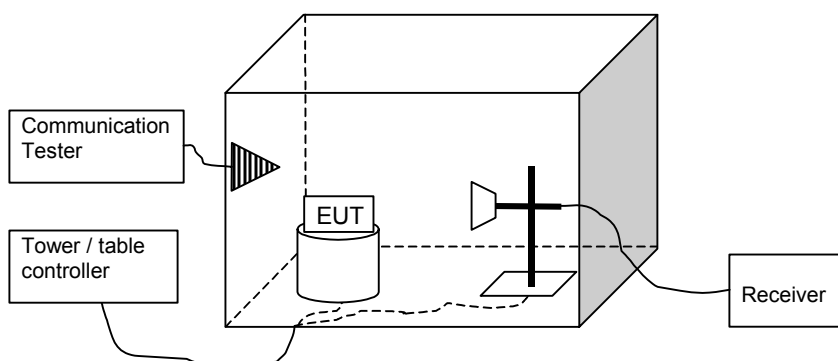
EGPRS mode, channel 661



4. Band edge compliance (FCC §22.917(a), 24.238(a), RSS-132 4.5, RSS-133 6.3)

EUT with DUT number	RM-56: EUT 40319
Accessories with DUT numbers	AC-4: EUT 40321, MU-17: EUT 40322, BL-5C:EUT 40323, HS-23:EUT 40324
Operation Voltage [V] / [Hz]	115/60
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/44/100.9-100.2
Date of measurements	25-26.8.2005
Measured by	Jan-Erik Lilja

4.1. Test setup



4.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-132 and RSS-133.

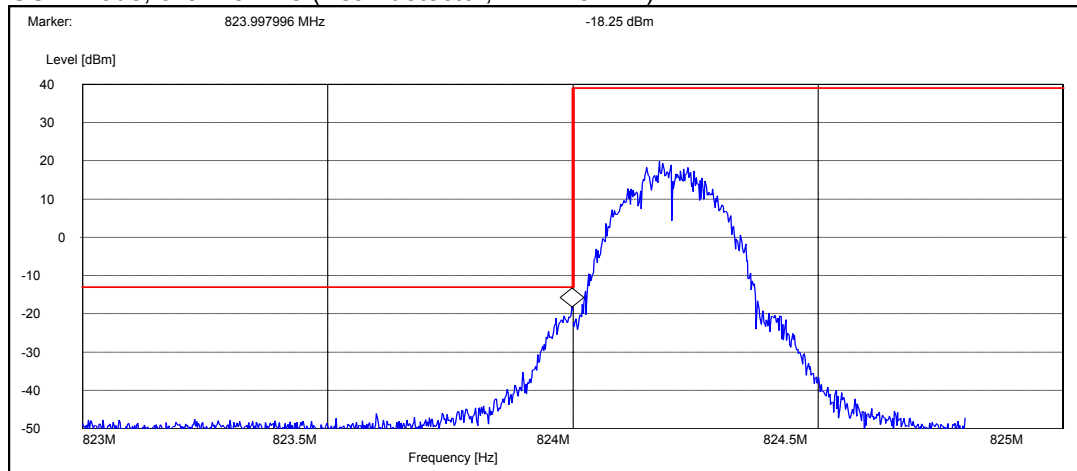
Limits for band edge compliance measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM 850	Below 824 and above 849	-13
GSM 1900	Below 1850 and above 1910	-13

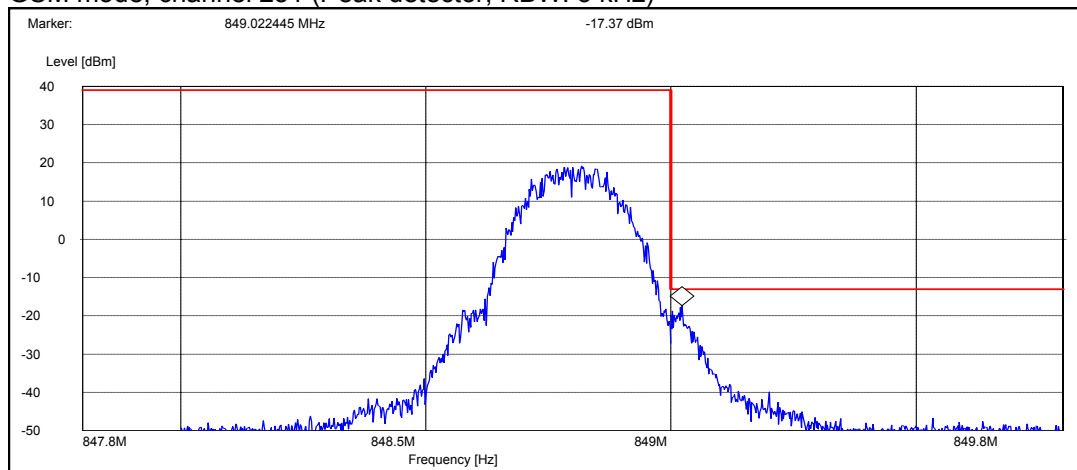
4.3. GSM 850 Test results

Operation mode (TX on)	Channel	Level [dBm]
GSM	128	-18.25
GSM	251	-17.37
EGPRS	128	-21.37
EGPRS	251	-24.05

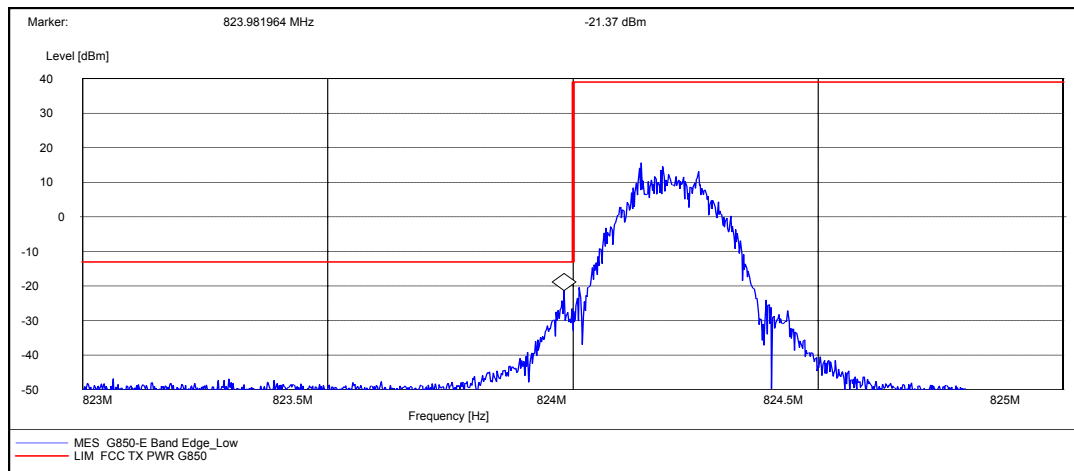
GSM mode, channel 128 (Peak detector, RBW: 3 kHz)



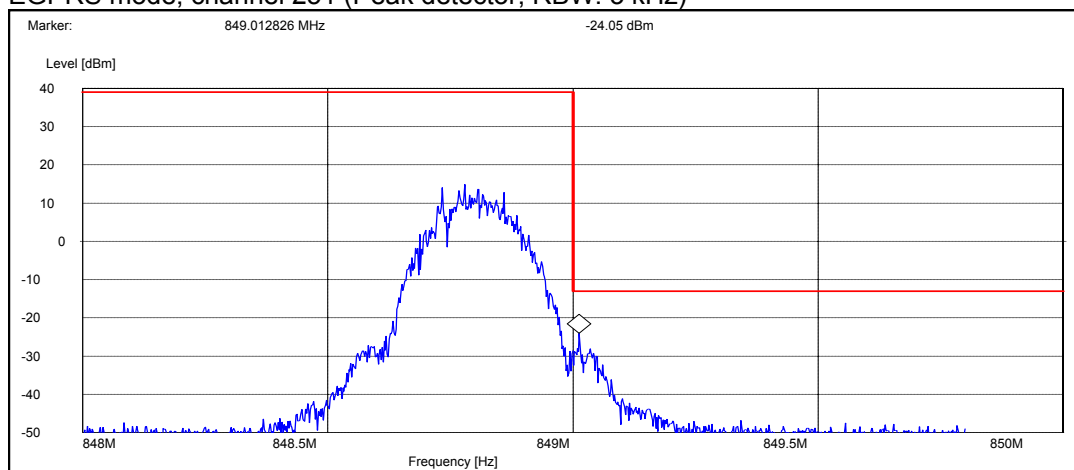
GSM mode, channel 251 (Peak detector, RBW: 3 kHz)



EGPRS mode, channel 128 (Peak detector, RBW: 3 kHz)



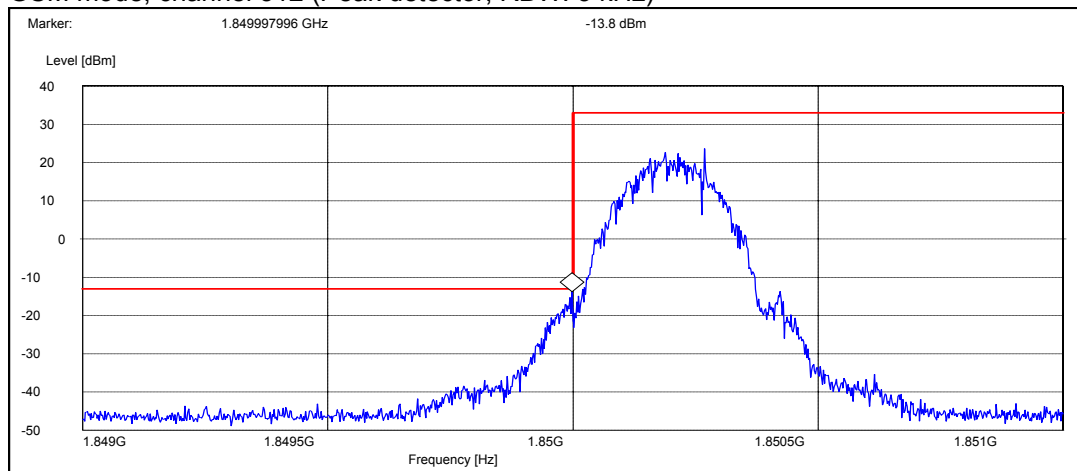
EGPRS mode, channel 251 (Peak detector, RBW: 3 kHz)



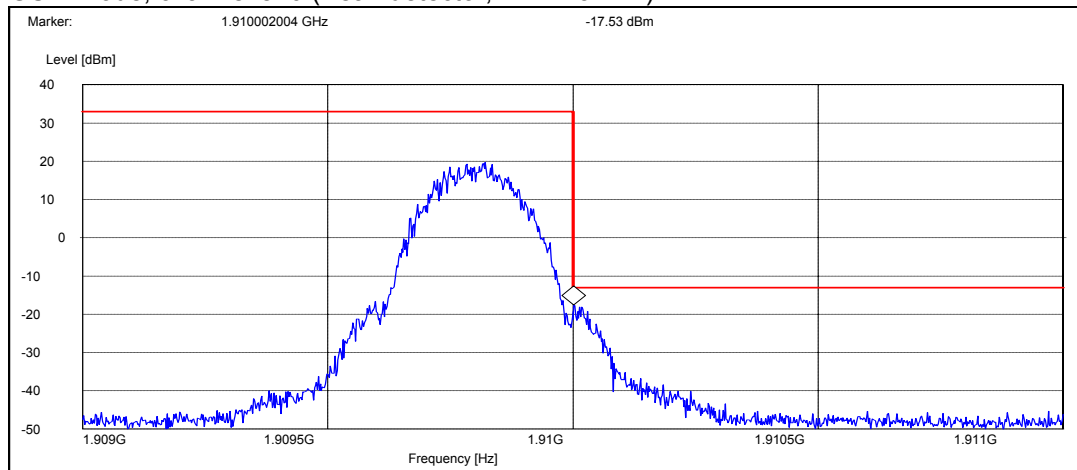
4.4. GSM 1900 Test results

Operation mode (TX on)	Channel	Level [dBm]
GSM	512	-13.80
GSM	810	-17.53
EGPRS	512	-20.48
EGPRS	810	-25.19

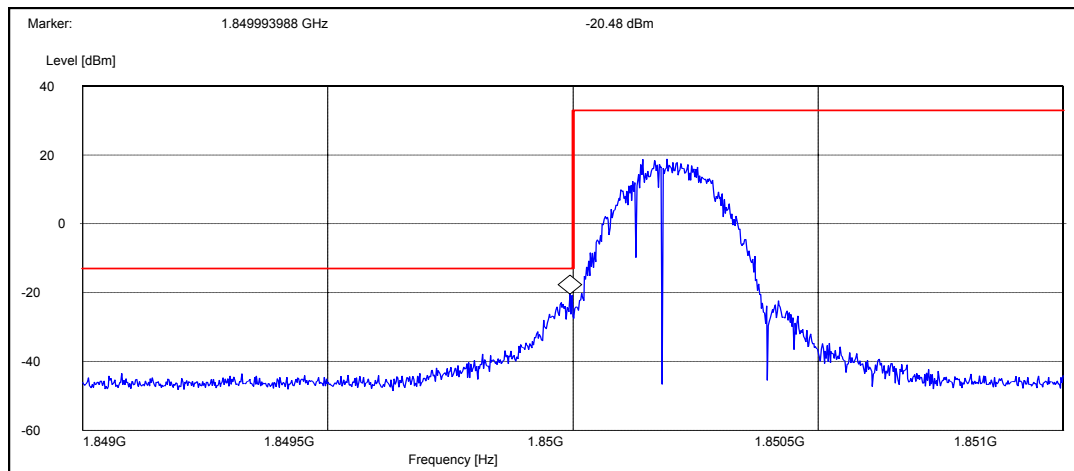
GSM mode, channel 512 (Peak detector, RBW: 3 kHz)



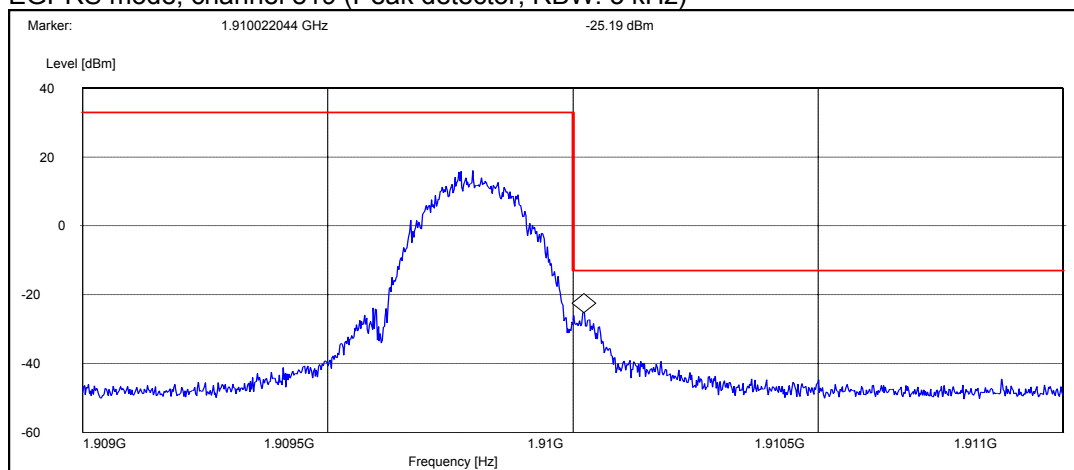
GSM mode, channel 810 (Peak detector, RBW: 3 kHz)



EGPRS mode, channel 512 (Peak detector, RBW: 3 kHz)



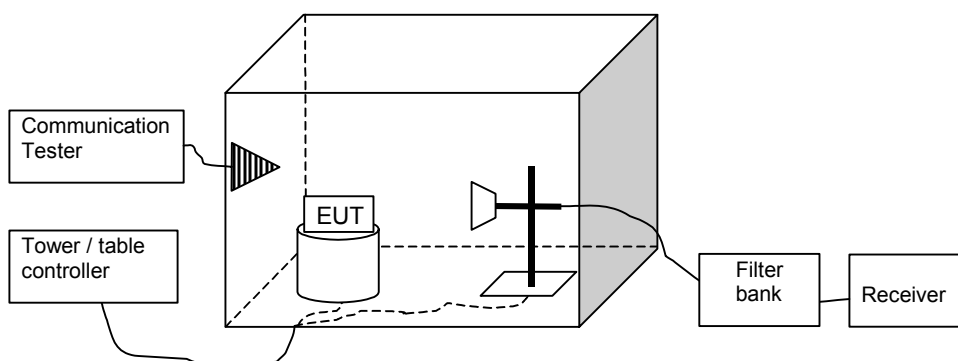
EGPRS mode, channel 819 (Peak detector, RBW: 3 kHz)



5. Spurious radiated emissions (FCC §22.917(a), §24.238(a), §2.1053, RSS-132 4.5, RSS-133 6.3)

EUT with DUT number	RM-56: EUT 40319
Accessories with DUT numbers	AC-4: EUT 40321, MU-17: EUT 40322, BL-5C:EUT 40323, HS-23:EUT 40324
Operation Voltage [V] / [Hz]	115/60
Result	Passed
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22/44/100.9-100.2
Date of measurements	25-26.8.2005
Measured by	Jan-Erik Lilja

5.1. Test setup



5.2. Test method and limit

The measurement is made according to TIA-603-B-2002 as follows:

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.
The substitution method is used. Substitution values at each frequencies are measured beforehand and saved to the test software.

The substitution corrections are obtained as described below:

$$A_{SUBST} = P_{SUBST_TX} - P_{SUBST_RX} - L_{SUBST_CABLES} + G_{SUBST_TX_ANT}$$

Where A_{SUBST} is the final substitution correction including receive antenna gain. P_{SUBST_TX} is signal generator level, P_{SUBST_RX} is receiver level, L_{SUBST_CABLES} is cable losses including both TX and RX cables and $G_{SUBST_TX_ANT}$ is substitution antenna gain.

The measurement results are obtained as described below:

$$P [dBm] = P_{MEAS} + A_{TOT}$$

Where P_{MEAS} is receiver reading in dBm and A_{TOT} is total correction factor including cable loss, preamplifier gain and substitution correction ($A_{TOT} = L_{CABLES} - G_{PREAMP} + A_{SUBST}$).

Limits for spurious radiated emissions measurements

Operation band	Frequency range [MHz]	Limit [dBm]
GSM 850	30 - 8500	-13
GSM 1900	30 - 18000	-13

5.3. GSM 850 Test results

GSM mode, channel 190

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1673.143287	-42.20	0.06026	- 35.80	- 6.40	HORIZONTAL	PASSED
2509.820641	-46.10	0.02455	- 47.10	1.00	VERTICAL	PASSED
3346.689379	-50.50	0.00891	- 55.60	5.10	HORIZONTAL	PASSED

EGPRS mode, channel 190

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
1673.143287	-45.80	0.02630	- 39.40	- 6.40	HORIZONTAL	PASSED
2509.820641	-52.40	0.00575	- 53.40	1.00	VERTICAL	PASSED
3346.189379	-55.70	0.00269	- 60.80	5.10	HORIZONTAL	PASSED

5.4. GSM 1900 Test results

GSM mode, channel 661

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3765.023046	-53.40	0.00457	- 62.60	9.20	VERTICAL	PASSED
5644.782565	-50.40	0.00912	- 62.90	12.50	VERTICAL	PASSED
5655.306613	-50.00	0.01000	- 62.40	12.40	HORIZONTAL	PASSED
7517.026052	-47.60	0.01738	- 63.90	16.30	VERTICAL	PASSED

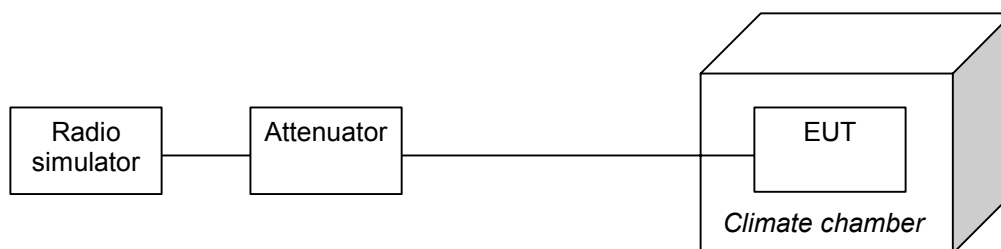
EGPRS mode, channel 661

Frequency [MHz]	P [dBm]	P [μ W]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarisation	Result
3760.023046	-42.20	0.06026	- 51.40	9.20	VERTICAL	PASSED
5639.782565	-42.60	0.05495	- 55.20	12.60	VERTICAL	PASSED
7517.026052	-48.90	0.01288	- 65.20	16.30	VERTICAL	PASSED

6. Frequency stability, temperature variation (FCC §2.1055(a), §2.1055(a), RSS-132 4.3, 6.3, RSS-133 7)

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4: EUT 40321, MU-17: EUT 40322, BL-5C:EUT 40323, HS-23:EUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22-23 / 42-45 / 102.8
Date of measurements	2-5.9.2005
Measured by	Jari Jantunen

6.1. Test setup



6.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-132 and RSS-133 as follows:

- The climate chamber temperature is set to the maximum value and the temperature is allowed to stabilize.
- The EUT is placed in the chamber.
- The EUT is set in idle mode for 45 minutes.
- The EUT is set to transmit.
- The transmit frequency error was measured immediately.
- The steps c - e were repeated for each temperature.

Limits for frequency stability, temperature variation measurements

Frequency deviation [ppm]
± 2.5

6.3. GSM 850 Test results

GSM mode, channel 190

Temperature [°C]	Deviation [Hz]	Deviation [ppm]
50	-29	-0.034664
40	-28	-0.033469
30	-30	-0.035859
20	-32	-0.038250
10	-31	-0.037055
0	-32	-0.038250
-10	-34	-0.040641
-20	-37	-0.044227
-30	-37	-0.044227

6.4. GSM 1900 Test results

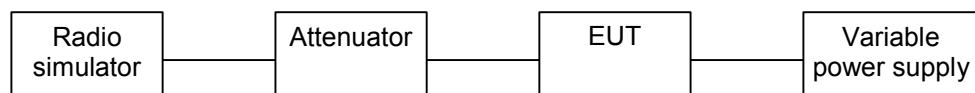
GSM mode, channel 661

Temperature [°C]	Deviation [Hz]	Deviation [ppm]
50	-55	-0.029255
40	-53	-0.028191
30	-59	-0.031383
20	-71	-0.037766
10	-77	-0.040957
0	-75	-0.039894
-10	-74	-0.039362
-20	-78	-0.041489
-30	-74	-0.039362

7. Frequency stability, voltage variation (FCC §2.1055(d), RSS-132 4.3, 6.3, RSS-133 7)

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	SD-4 v.1161 DUT 40241
Operation Voltage [V] / [Hz]	3.3 V / 3.9 V
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 102.8
Date of measurements	5.9.2005
Measured by	Jari Jantunen

7.1. Test setup



7.2. Test method and limit

The measurement is made according to FCC rules part 22 and 24 and IC standards RSS-132 and RSS-133 as follows:

The EUT battery was replaced with an adjustable power supply. The frequency stability was measured at nominal voltage and at the battery cut-off point.

Limits for frequency stability, voltage variation measurements

Frequency deviation [ppm]
± 2.5

7.3. GSM 850 Test results

GSM mode, channel 190

Voltage level [V]	Deviation [Hz]	Deviation [ppm]
Nominal / 3.9	-39	-0.046617
Battery cut-off point / 3.3	-37	-0.044227

7.4. GSM 1900 Test results

GSM mode, channel 661

Voltage level [V]	Deviation [Hz]	Deviation [ppm]
Nominal / 3.9	-95	-0.050532
Battery cut-off point / 3.3	-86	0.045745

8. Test Equipment

8.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM37610	Spectrum analyzer	FSU	R&S	15C, 22/24
TM37678	Radio communication tester	CMU-200	R&S	15C, 22/24
	Attenuator 10 dB	6251.17.A	Huber+Suhner AG	15C, 22/24
TM22901	Step attenuator 110dB	8496A	Agilent	15C, 22/24
TM37499	Power splitter	11667A	Agilent	15C, 22/24
	Temperature chamber	VT4002	Vötsch	15C, 22/24
TM38112	DC power supply	6632A	Agilent	15C, 22/24
TM38111	Multimeter	34401A	Agilent	15C, 22/24
TM38845	EMI receiver	ESI 40	R&S	15B, 15C
TM37773	Radio communication tester	CMU-200	R&S	15B, 15C
TM38631	Signal generator	83640L	Agilent	15B, 15C
TM38114	DC power supply	6632A	Agilent	15B, 15C
TM22835	Multimeter	87	Fluke	15B, 15C
TM30600	Pulse Limiter	ESH3-Z2	R&S	15B, 15C
TM26490	LISN 50 µH	ESH3-Z5/	R&S	15B, 15C
TM30636	LISN 50 µH	L2-16/	PMM	15B, 15C

8.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30599	3m semi-anechoic chamber		TDK	15B, 15C, 22/24
TM38845	EMI receiver	ESI 40	R&S	15B, 15C, 22/24
TM37498	Preamplifier	AMF-5D-020180-26-10P	MITEQ	15B, 15C, 22/24
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	MITEQ	15B, 15C, 22/24
TM37516	Biconilog antenna	HL562	R&S	15B, 15C, 22/24
TM26496	Double ridged waveguide antenna	3115	EMCO	15B, 15C, 22/24
TM39158	Horn antenna	3116	EMCO	15B, 15C, 22/24
TM26492	Reference dipole set	UHAP/VHAP	Schwarzbeck	15B, 15C, 22/24
TM37501	Dipole antenna	3125-870	EMCO	22/24
TM37502	Dipole antenna	3125-1880	EMCO	22/24
TM37773	Radio communication tester	CMU-200	R&S	15B, 15C, 22/24
TM38631	Signal generator	83640L	Agilent	15B, 15C, 22/24
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	15B, 15C, 22/24
	High pass filter	WHK2010-10SS	Trilithic	15B, 15C, 22/24
	Low pass filter	WLK1750-10SS	Trilithic	15B, 15C, 22/24
TM26511	Tunable notch filter	WRCA870	Wainwright	22/24
TM38215	Tunable notch filter	WRCD1850/1910-0.2/40	Wainwright	22/24
TM38214	Band reject filter	WRCT 2402/2480-2400/2483.5-30	Wainwright	15C
TM30642	Turntable controller	HD-100	Deisel	15B, 15C, 22/24
TM26500	Turntable	DS412	Deisel	15B, 15C, 22/24
TM38842	Antenna mast controller	2090	EMCO	15B, 15C, 22/24
TM38843	Antenna mast	2075	EMCO	15B, 15C, 22/24
TM38114	DC power supply	6632A	Agilent	15B, 15C, 22/24
TM22835	Multimeter	87	Fluke	15B, 15C, 22/24